Rec'd PCT/PTO 08 JUN 2005

10/538486

WO 2004/067102

PCT/US2004/002245

EXERCISE MACHINES WITH ENTERTAINMENT THEMES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of provisional application 60/442,596, filed January 24, 2003.

BACKGROUND OF THE INVENTION

[0002] An aspect of fitness exercise is to make the body to endure certain physical strain. The intensity of physical strain is important to the effectiveness of the exercise. The physical strain, however, discourages the exercisers from continuing, and therefore, negatively impacts certain aspects of exercise.

[0003] This invention provides various ways, especially of using virtual reality scenes and video games, to make physical challenge a favorable factor in exercise.

BRIEF SUMMARY OF THE INVENTION

[0004] One aspect of the present invention is embedding video based motivation into exercise programs. Physical challenge becomes a part of achieving a goal. An embodiment of the present invention provides for a system including an exercise apparatus, a controller, and a video display. The controller receives input signals from the exercise apparatus. The controller tracks a distance traveled by the user. To motivate the user, the controller displays video images on the video display based on the distance traveled and corresponding to an actual location. One example, the system incorporates a mountain bike program to a stationary exercise bike. When riding through challenge areas in the course such as, hills, sand, or bumpy sections, the resistance of the bike increases. The exercise will be both physically challenging and fun.

[0005] Another aspect of the present invention is to recognize significant achievements as the incentive to persistent effort. For example, the invention includes virtual cross-country jogging/walking programs. The exerciser selects a program, e.g., running coast-to-coast. The exercise machine keeps the log of each user and accumulates the distance the user travels over multiple sessions. Day after day, month after month, the user runs through many major milestones, such as passing through major cities, and eventually reaches a goal.

[0006] Yet another aspect of the present invention is to reward the exercisers with knowledge and virtual world experience. For example, a video will display a scene as if the exerciser was actually running on the highway/country road of the particular area. There is video/audio introduction to the attractions along the journey.

[0007] The present invention also includes various kinds of software which are provided for different users with different physical conditions, different interest, and different exercise objectives.

[0008] Further objects, features and advantages of the invention will become apparent from consideration of the following description and the appended claims when taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Figure 1 is a perspective view of an exercise bike of one embodiment of the present invention;

[0010] Figure 2 is a perspective view of a seat frame having a bouncing motion simulation sub-system of the exercise bike in Figure 1;

[0011] Figure 3 is a perspective view of a treadmill of another embodiment of the present invention;

[0012] Figure 4 is a perspective view of the treadmill where it shows the add-on sensors to pick the motion of the tread;

[0013] Figure 5 shows an embodiment that has multiple display panels which offers panoramic view of the scenes; and

[0014] Figure 6 shows the architecture of networked exercise machines and information management framework.

DETAILED DESCRIPTION OF THE INVENTION

[0015] Now referring to Figure 1, a system embodying the principles of the present invention is illustrated therein and designated at 9. The system 9 includes an exercise bike 10, a support frame 11, a display screen 19, and a controller 22.

[0016] The support frame 11 is sturdy to support the weight of the user and the other components. The support frame 11 suspends the display screen 19 and controller 22 in a manner that provides access to the user during operation of the exercise bike 10.

[0017] The display screen 19 displays animated graphic images or real video images including road scenes or off-road scenes. It may also serve as the input device with a touch screen input feature. It is to be understood that animated or video images may be implemented within the system by any suitable means without falling beyond the scope or spirit of the present invention. Speakers 20 are provided that play audio sound, include music, voice, and simulated background noise.

Headphones could also be used to provide sound where lower noise levels or privacy is desired.

[0018] The controller 22 has a microprocessor, a software input device (such as a CD or a DVD reader), on board memory (hard disk), and a peripheral control board (such as analog/digital converters). A pulse sensor 23 is connected to the handlebar 17 and picks up the pulse of the operator as the operator touches the electrical conductive part of the pulse sensor 23. The pulse sensor 23 can also pick up pulse signals wirelessly from a sensor unit on the operator's wrist, chest, or neck.

[0019] Switch buttons 24 are provided for basic functions (such as On/Off, start, stop, pause, audio volume, etc.) and are located on the display. More detailed selections will be inputted from the touch screen menus.

[0020] Software is located in the controller 22 and is configured to receive the following input signals: pedaling rotational motion signal, handlebar direction signal, brake signal, gear selection signal, pulse readings from the pulse sensor, switch status, user login information, and other user profile input. The software is configured to provide output signals including: signals to control the amount of pedaling resistance, signals to drive seat vertical motion, visual display graphics, audio sound signal, and user exercise effectiveness information.

[0021] The exercise bike 10 generally includes a seat frame 12, an electric motor 13, a magnetic resistance device 14, and a handlebar 17. The support frame 11 is attached to the seat frame 12. The motor 13, the magnetic resistance device 14, and the handle bar 17 are coupled to the seat frame 12.

[0022] Now referring to Figure 2, the seat frame 12 has one end attached to the support frame under the handlebar 17 with a rotational joint and another end underneath the seat connected to a crank 28.

[0023] The electric motor 13 which may take the form of a conventional DC motor, a servo motor, or a step motor, drives the crank 28 making the seat frame 12 to pivot about the rotational joint in the front. This approximates the seat vertical motion to simulate a bike bouncing effect. The motion produced by the motor 13 is synchronized to the scene.

[0024] A magnetic resistance device 14 applies resistance to a ferrous flywheel to simulate the climbing or road/wind resistance. The resistance level is controlled by electronic signals sent from the controller 22 and synchronized to the scene. A step motor 26 and a worm-gear are used in one of the possible embodiments of the magnetic resistance device 14. The step motor 26 drives a worm-gear and then drives a dial to control the resistance.

[0025] Two brakes 15 are mounted on the handlebar 17 and connected with braking signal sensors. The braking signal sensors provide a signal to the controller 22 indicating the user's intent to slow down.

[0026] Two gear selectors 16 are mounted on the handlebar 17 and provided for the operator to indicate the gear selection. The gear selection is sensed through angular sensors or rotary switches.

[0027] An angular sensor is coupled with the handlebar 17 and configured to sense the rotational angle of the handlebar 17. The angular sensor sends a signal to the controller based on the rotational angle of the handlebar 17.

[0028] A pair of pedals 18 are coupled to a chain or a belt. The chain or belt drive a ferrous flywheel. The speed of pedaling is determined by a Reed switch or a photoelectric sensor mounted proximate the ferrous flywheel.

[0029] Now referring to Figure 3, another system in accordance with one embodiment of the present invention is provided. The system includes a treadmill 40, a display device 44, and a controller 48. The display device 44 and speakers 45 which have features similar to the ones used in the exercise bicycle device. The controller 48 is configured to receive input signals from the system sensors including: the speed of the tread belt, walking direction intention signal, switch status, pulse signal, user login information, and user profile input. The controller 48 will provide output signals to drive the display graphics, audio sound signal, inclination of the tread, and the user exercise effectiveness information. Switch buttons 49 are also provided for basic functions such as On/Off, start, stop, pause, audio volume, etc. More detailed user selections will be inputted from the touch screen menus. The display device 44 and controller 48 are supported by the frame 41 of the treadmill.

[0030] The frame 41 supports the user, and system components including the tread belt, the motor, and the inclining mechanism 43, the controller 48, the display device 44, etc. A tread speed sensor 42 is provided to measure the speed of the tread belt. The tread speed sensor 42 is made of a photoelectric sensor which picks up rotational motion signals from the tread driving axel. Alternatively, as shown in Figure 4, the tread speed can also be picked directly from the tread by adhering a tape 60 on the edge of the tread. The tape is printed with reflective marks. A lamp 61 casts a ray of light on the tape 60. Having a photoelectric sensor

62 picking the reflection of the light, the tread motion can be determined. Both the lamp 61 and the photoelectric sensor 62 can be mounted on a bracket 63 that can be installed on most of the existing treadmills. With this setting, this invention can be used on many existing equipments without complicated alteration

[0031] Referring again to Figure 3, the inclining mechanism 43 controls the slope of the tread. A motor is provided to drive the inclining mechanism 43. Walk direction sensors 46 are attached to the frame and used to indicate the intentional walking direction of the operator at the crossroad scenes. This is realized with a pair of proximity sensors on the handlebar. A pulse sensor 47 is also mounted on the frame and picks up the heart beat rate of the operator. The walk direction sensors 46 can be combined with the pulse sensor 47.

[0032] It is also contemplated that other forms of exercise equipment such as rowing machines or elliptical trainers may be used in the same manner as the bike and treadmill described above.

[0033] In the mountain bike embodiment, there are various road conditions corresponding to different scenes. The exercise bike will generate bouncing effect when pedaling in a bumpy road scene. The riding resistance will increase when pedaling through virtual scenes of uphill, against the wind, in sand, or other obstacles. Shifting the gear down will reduce the resistance, but however, will also slow down the moving speed. Shifting the gear up will increase the resistance but also increase the moving speed. Scores will be given based on the hardness of the passing scene, the distance to travel, and the time in completing the course. In the

treadmill embodiment, the inclination of the tread is driven by a DC motor according to the scenes in the course. The steeper the tread, the more difficult is the exercise.

[0034] The system includes a program providing virtual geographic scenes of landscapes of city in which an exerciser is virtually located. For example, the program may be configured in any suitable manner to include details specific to each road or off-road, such as historic architectures, monuments, sculptures, landscapes or other actual locations, in a particular town or city. As such, the distance the user travels on the exercise apparatus determines when they will reach the next location thereby displaying the corresponding images. Further, the distance the user must travel to reach each location may be related to the actual distance between actual locations. The program allows the exerciser to journey or roam about any given city. Other interactive features may be implemented to simulate an actual jog or ride along a particular road or off-road. For example, the program may include a chase feature wherein the exerciser has an option of pursuing an animated figure or being pursued by an animated figure to encourage physical activity. In another example, the program may include other interactive features such as moving vehicles, cycles, and individuals within the area in which the exerciser is virtually located.

[0035] In addition, video photography is used to present the scene of the world that the exerciser is located. To make video scenes, mpeg video clips are shot and indexed to corresponding spots along the journey. The video will be mostly shot from the exerciser's view by a moving camera. At the time of playback, the video clip will be played at the speed synchronized to the jogging/riding speed. For example, if the camera was moving at 25 mph (miles per hour) when the video was shot at 29.97 fps (frames per second), the video will be played at roughly 4.995 fps if the

exerciser's jogging speed is at 6 mph. A 3D animation image of a jogger/rider can be overlaid with video image to create a more personalized feel. Panoramic view video clips are also shot to supply the exercisers with even better feeling of the surrounding areas and clips from these video clips will by cut-in making the journey more interesting.

[0036] Instead of monotonic display of either an animated scene or a video photography, the software presents the theme contents using a combination of various type of material. 2D and 3D animation will be used to increase the artistic presentation of the setting. Video, 3D animated terrain with historic buildings, rendering of weather conditions, and dynamic zooming in/out of a map where the exercise is located are alternatively used to increase the visual effects of the software. Further, multiple displays 66 may be used to provide peripheral vision or show panoramic images, as shown in Figure 5. In addition, music of user's preference is also available to entertain the exerciser.

[0037] In cross-country traveling course programs, the accumulated mileage from multiple sessions of a specific user will be used to indicate how far the user has traveled and to determine which scene to display. For example, in the TransAmerica program, the jogger starts from the east coast in Virginia beach, he/she runs from town to town, state to state, passing Kentucky, Missouri, Colorado,..., and finally reaches the west coast in Oregon. Along the "journey", other than the scenes presented with video and 3D animated world, the software presents information about historical landmarks, architectures, local attractions, local events, local culture/social knowledge, and even real time local news. It is an experience of a few in the real world, but is possible for many in the virtual world. "You don't see until you

reach there" creates motivational anxiety and excitement, which encourages persistent exercise effort and reduces boredom. The information about the historical sites, local culture, architectures, local attractions, and etc. can be collected from the Internet, travel books, tour guides, etc. Connected to the Internet, the latest local news can be presented with technologies that convert text to voice. Further, the system can provide a virtual reality experience of famous race events, such as marathons known around the world and the Tour de France.

[0038] Now referring to Figure 6, the system keeps the user profiles and exercise history. Connected to the Internet 68, the user profile and exercise history can be stored on a global server 70. The exercise history can be retrieved from exercise machines 72 with the same function anywhere around the world. While using such an exercise machine, a user can choose to enter his/her screen name every time he/she uses the device, and hence exercise history can be logged and retrieved for each user. Statistics such as frequency of exercise, intensity and duration of exercise, total exercise achievements within certain period can be easily calculated and recorded. In addition, accumulated exercise effort over multiple sessions and averages of exercise intensity measure can be provided. Preferably, the exercise intensity measures are in terms of exercise effectiveness over a specific period of time. The personal exercise history and statistics can be compared with exercise goals. User profile and exercise history can also be carried with portable data storage devices such as a smart card, a floppy disk or a USB storage drive. In case that the Internet connection is not available or the user prefers not to use the global server, a user can log or retrieve the exercise history by simply inserting the data storage media into any exercise machine with the same function.

[0039] Exercise history can be used for virtual group exercise in cross-country courses. For example, family members can exercise at different times but reference to each other as if they jog/walk at the same time, with shadow image or indicating symbols on the map. Once the controller is connected to the web, the exercise history can be shared among friends and family members located at different locations via Internet. In this embodiment, the system allows the exerciser to interact with other users. Interactiveness with other users allows continued encouragement of physical activity while maintaining a level of entertainment.

[0040] Connected through the Internet, this software also provides social setting that promotes the exercisers communicating with each other. The global server presents the users who are joining the program and their virtual traveling locations on the map. Therefore, Kitty (screen name), for example, may see five people "traveling" in the vicinity of her virtual location. She could chat/e-mail with them on and off the line. Such social setting adds motivation and can naturally facilitate the formation of a forum among the users. Certainly, exercisers can opted to make them silent or "hidden" if they prefer to do so.

[0041] As a person skilled in the art will readily appreciate, the above description is meant as an illustration of implementation of the principles this invention. This description is not intended to limit the scope or application of this invention in that the invention is susceptible to modification, variation and change, without departing from spirit of this invention, as defined in the following claims.